

PATENT ABSTRACTS OF JAPAN

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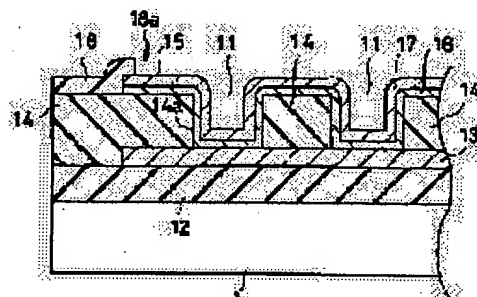
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(54) SEMICONDUCTOR DEVICE

(57)Abstract:

PURPOSE: To prevent a crack from being generated in a thick insulating film on a silicon substrate by a shock during a bonding work and to provide a bonding pad, whose wiring layer is never peeled from its base.

CONSTITUTION: A polycrystalline silicon layer 13 is provided on a thermal oxide film 12, an interlayer insulating film 14 having a plurality of opening parts 14a, which are smaller than the contact surface of a bonding pad to a bonding wire and reach the layer 13, is provided on this layer 13 and a wiring layer 15, which is used as the bonding pad, is provided on this film 14 and on the internal surfaces of the opening parts 14a. As a result, a shock during a bonding work is relaxed by the layer 13 and the film 14 and the generation of a crack in the film 12 can be prevented. Moreover, as the layer 15 consists of a barrier metal layer 16 and an aluminium layer 17, the close contact property of the layer 13 to the layer 15 is good.



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CLAIMS

[Claim(s)]

[Claim 1] The semiconductor device characterized by providing the following. The 1st insulator layer prepared on the semiconductor substrate front face. The 1st wiring layer prepared on the 1st insulator layer of the above. The 2nd insulator layer which has two or more openings which reach the 1st wiring layer of the above smaller [it is prepared on the 1st wiring layer of the above, and] than the contact surface of a bonding wire. The 2nd wiring layer which was prepared in the 2nd insulator layer top of the above, and the opening inside, and touched the 1st wiring layer of the above in the aforementioned opening.

[Claim 2] The semiconductor device according to claim 1 characterized by having the 3rd insulator layer and 3rd wiring layer between the 1st insulator layer of the above, and the 1st wiring layer of the above.

[Claim 3] The 1st wiring layer of the above is a semiconductor device according to claim 1 characterized by the bird clapper from polycrystal silicon.

[Claim 4] The 1st wiring layer of the above is a semiconductor device according to claim 1 characterized by the bird clapper from silicide.

[Claim 5] The 1st wiring layer of the above is a semiconductor device according to claim 1 characterized by the bird clapper from the object which carried out the laminating of polycrystal silicon and the silicide.

[Claim 6] The 2nd wiring layer of the above is a semiconductor device according to claim 1 characterized by the bird clapper from the barrier metal layer which consists of titanium and a titanium nitride, and an aluminum layer.

[Claim 7] The 2nd insulator layer of the above is a semiconductor device according to claim 1 characterized by the bird clapper from PSG or BPSG.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to a bonding pad with respect to a semiconductor device.

[0002]

[Description of the Prior Art] Drawing 4 is the cross section showing the bonding pad in the conventional semiconductor device. The thick insulator layer 2 is formed in the front face of a silicon substrate 1, and the layer insulation film 3 on which it makes it come to deposit a silicon oxide is formed on this thick insulator layer 2. The wiring layer 4 is formed on this layer insulation film 3, and this wiring layer 4 consists of an aluminum layer 5 and a barrier metal layer 6. This barrier metal layer 6 is formed between the aluminum layer 5 and the layer insulation film 3; and the aluminum layer 5 as the aforementioned bonding pad is exposed from opening 7a prepared in the protection oxide film 7 which protects the layer insulation film 3.

[0003] Since the above-mentioned conventional bonding pad has the bad adhesion of the barrier metal layer 6 and the layer insulation film 3, a wiring layer 4 may separate from the layer insulation film 3 during bonding work. In order to prevent this, the bonding pad which prepared the polycrystal silicon layer or the silicide layer in the bottom of the barrier metal layer 6 is considered.

[0004] Drawing 5 shows the example which formed the polycrystal silicon layer 8 in the bottom of the barrier metal layer 6, namely, the above — the polycrystal silicon layer 8 is formed on the thick insulator layer 2. Opening 3a is prepared in the aforementioned layer insulation film 3, and the aforementioned wiring layer 4 is formed on the polycrystal silicon layer 8 within this opening 3a.

[0005] In the above bonding pads, while the adhesion of the aforementioned barrier metal layer 6 and the polycrystal silicon layer 8 is good, the adhesion of the polycrystal silicon layer 8 and the thick insulator layer 2 is also good. For this reason, the aforementioned wiring layer 4 does not separate from the layer insulation film 3 during bonding work.

[0006]

[Problem(s) to be Solved by the Invention] By the way, between the wiring layer 4 by which bonding is carried out, and the thick insulator layer 2, the polycrystal silicon layer 8 is only formed. For this reason, the shock under bonding work may be transmitted from a wiring layer 4 and the polycrystal silicon layer 8 to the thick insulator layer 2, and a crack may arise in this thick insulator layer 2.

[0007] The purpose of this invention is to offer the semiconductor device in which a crack does not arise in the thick insulator layer on a silicon substrate, and a wiring layer and its ground do not separate by the shock under bonding work in a bonding pad.

[0008]

[Means for Solving the Problem] The 1st insulator layer prepared on the semiconductor substrate front face in order that this invention might solve the above-mentioned technical problem, The 1st wiring layer prepared on this 1st insulator layer, and the 2nd insulator layer which has two or more openings which reach the 1st wiring layer of the above smaller [it is

10 of a bonding pad 9 and a bonding wire was formed, and the wiring layer 15 is formed on this layer insulation film 14 and in opening 14a. Therefore, in case a bonding wire is connected on this wiring layer 15, the shock is eased with the polycrystal silicon layer 13 and the layer insulation film 14, and generating of the crack of the thermal oxidation film 12 can be prevented. Moreover, among the aforementioned wiring layers 15, since a lower layer consists of a barrier metal layer 16, the polycrystal silicon layer 13 and wiring layer 15 in a part of the opening 14a have adhesion good [a lower layer]. Therefore, the polycrystal silicon layer 13 and a wiring layer 15 do not separate.

[0014] Drawing 3 shows the 2nd example of this invention, gives the same sign to the same portion as drawing 2 , and explains only a different portion. That is, in this example, the 2nd wiring layer 19 which consists of a polycrystal silicon layer with a thickness of 4000Å between the thermal oxidation film 12 and the 1st wiring layer (polycrystal silicon layer) 13, and the 2nd layer insulation film 20 which consists of BPSG with a thickness of 5000Å are formed.

[0015] since the same effect as the 1st example could be acquired also in the 2nd example of the above and the 2nd wiring layer 19 and the 2nd layer insulation film 20 are moreover formed between the thermal oxidation film 12 and the 1st wiring layer 13, the shock which is bonding working further can be eased

[0016] In addition, when the configuration of this opening is a square, it is [that what is necessary is just smaller enough than the contact surface of a bonding pad and a bonding wire] desirable [without limiting the semiconductor device of this invention to the above-mentioned example, / the size of opening prepared in a layer insulation film] that a length of one side is 10 micrometers or less. Moreover, the configuration of opening may be a rectangle or a round shape, and can be changed variously.

[0017] Furthermore, between the aforementioned thermal oxidation film and a polycrystal silicon layer, two or more wiring layers and layer insulation films may be prepared, and the quality of the material of the 2nd wiring layer of the above and the 2nd layer insulation film may use material other than a polycrystal silicon layer and BPSG.

[0018]

[Effect of the Invention] According to this invention, as explained above, the 1st wiring layer was prepared on the 1st insulator layer, the 2nd insulator layer which has two or more openings which reach the 1st wiring layer smaller than the contact surface of a bonding pad and a bonding wire was prepared on this 1st wiring layer, and the 2nd wiring layer as a bonding pad is provided in this 2nd insulator layer top and the opening inside. For this reason, the shock under bonding work is eased by the 1st wiring layer and the 2nd insulator layer, and generating of the crack of the 1st insulator layer can be prevented. And since the 1st wiring layer of the above consists of an object which carried out the laminating of polycrystal silicon, silicide, or polycrystal silicon and silicide and the 2nd wiring layer of the above consists of a barrier metal layer and an aluminum layer, the 1st wiring layer and 2nd wiring layer have good adhesion. Therefore, ablation with the 1st wiring layer and the 2nd wiring layer can be prevented.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The plan showing the bonding pad in the semiconductor device of the 1st example of this invention.

[Drawing 2] The cross section which met 4-4 line shown in drawing 1 of the 1st example of this invention.

[Drawing 3] The cross section which shows the 2nd example of this invention and transformed drawing 2.

[Drawing 4] The cross section showing the bonding pad in the conventional semiconductor device.

[Drawing 5] The cross section showing the bonding pad in the conventional semiconductor device.

[Description of Notations]

1 — Silicon Substrate and 9 — Bonding Pad, 10 [— Thermal Oxidation Film, 13 / — Polycrystal Silicon Layer (1st Wiring Layer) 14 / — Layer Insulation Film (1st Layer Insulation Film) 15 / — Wiring Layer, 16 / — Barrier Metal Layer, 17 / — Aluminum Layer, 18 / — Protection Insulator Layer, 19 / — 2nd Wiring Layer, 20 / — 2nd Layer Insulation Film] — Contact Surface of Bonding Pad and Bonding Wire, 11 — Crevice, 12

[Translation done.]